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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/665,193	09/18/2003	Koji Tojo	F-7841	5575

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EXAMINER	
GOLUB, MARCIA A	

ART UNIT	PAPER NUMBER
2828	

DATE MAILED: 09/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/665,193	TOJO, KOJI
	Examiner	Art Unit
	Marcia A. Golub	2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *18 September 2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Wavelength conversion laser apparatus with tunable fiber Bragg grating.

Claim Objections

Claim 9 is objected to because of the following informalities: Claim 9 recites the limitation "grating expanding means" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim since claim 9 depends on claim 7. Claim 9 should be dependent on claim 8. Appropriate correction is required.

Claim Rejections - 35 USC § 103

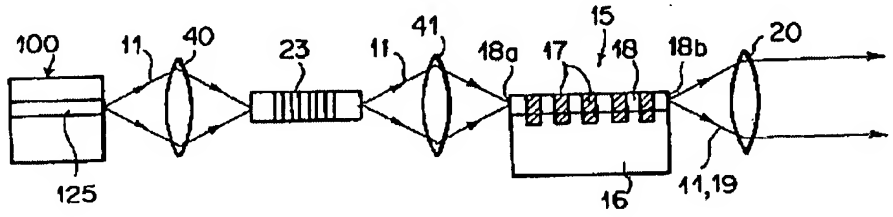
The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa (U.S. Pub. 2002/0009102) and further in view of Bailey et al. (U.S.Pat. 6,470,036).

Regarding **claim 1**, Fig 24 of Hayakawa discloses "A wavelength conversion laser apparatus comprising a semiconductor light device [100], an optical fiber having a grating [23] provided therein, a wavelength conversion device [15] for receiving an input

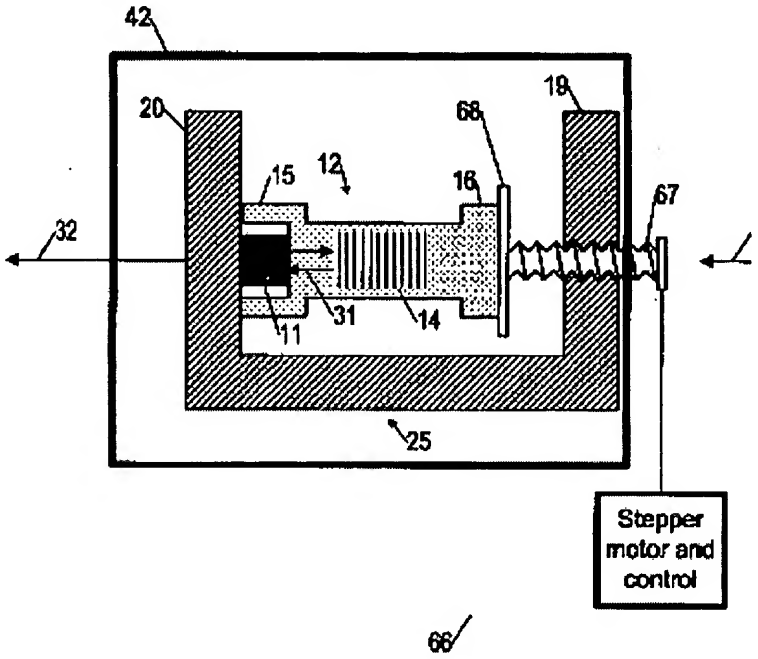
light from an optical resonator which consists mainly of the semiconductor light emitting device [100] and the optical fiber [23] and releasing a harmonic of the input light [2nd harmonic, paragraph 197 lines 4-7]. Hayakawa does not discloses "A grating expanding means for expanding the grating in its lengthwise direction to match the wavelength of the output light from the optical resonator with the wavelength of the input light, where the wavelength of the input light can be converted by the wavelength conversion device".



However, Fig 5 of Bailey discloses a tunable Bragg grating that adjusts the wavelength of the output light by changing the length of the fiber Bragg grating. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Bailey into the device of Hayakawa by substituting the fiber Bragg grating with a tunable fiber Bragg grating. The ordinary artisan would have been motivated to modify Hayakawa in the manner set forth above for at least the purpose of making the laser output more stable by making it independent of the ambient temperature.

Regarding **claim 2**, Hayakawa and Bailey disclose a wavelength conversion laser apparatus as described above, "wherein the grating expanding means comprises a base [25] having a first retainer [20] provided for securing the optical fiber [12, 14], a

movable nut [68] arranged for slidably moving on the base and having a second retainer [68] provided for securing the optical fiber, a lead screw [67] threaded with the movable nut, and a rotating means [66] for rotating the lead screw. (Fig 5 of Bailey)

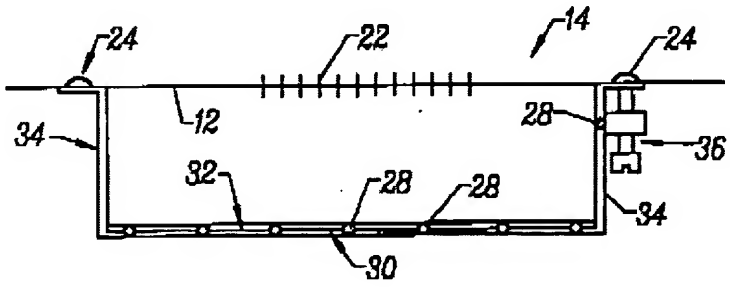


Claims 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa (U.S. Pub. 2002/0009102) and further in view of Pan et al. (U.S.Pat 6,181,851).

Regarding **claim 1**, Fig 24 of Hayakawa discloses "A wavelength conversion laser apparatus comprising a semiconductor light device [100], an optical fiber having a grating [23] provided therein, a wavelength conversion device [15] for receiving an input light from an optical resonator which consists mainly of the semiconductor light emitting device [100] and the optical fiber [23] and releasing a harmonic of the input light [2nd harmonic, paragraph 197 lines 4-7]. Hayakawa does not discloses "A grating expanding

means for expanding the grating in its lengthwise direction to match the wavelength of the output light from the optical resonator with the wavelength of the input light, where the wavelength of the input light can be converted by the wavelength conversion device".

However, Fig 2A of Pan discloses a tunable Bragg grating that adjusts the wavelength of the output light by changing the length of the fiber Bragg grating. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Pan into the device of Hayakawa by substituting the fiber Bragg grating with a tunable fiber Bragg grating. The ordinary artisan would have been motivated to modify Hayakawa in the manner set forth above for at least the purpose of making the laser output more stable by making it independent of the ambient temperature.



Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa and Pan, and further in view of Eldada et al (U.S. Pub. 20030021535).

Regarding **claims 3 and 4**, Hayakawa and Pan disclose a wavelength conversion laser apparatus as described above,

"wherein the grating expanding means comprises a bar-like heat-sensitive expandable member [30, 32] for securing the optical fiber [12] at two locations [34] between which the grating [22] is installed,

wherein the heat-sensitive expandable member [30,32] comprises two or more materials [stainless steel and Kovar™, col. 5 lines 26-28], which are different in the linear expansion coefficient (col.5 lines 15-17) and are bonded to each other [28] (Fig 2A of Pan).

Hayakawa and Pan do not disclose "a heating means for heating the heat-sensitive expandable member to increase the distance including the grating between the two locations"; the tunable Bragg rating in the Pan's invention is controlled by the ambient temperature. However, paragraph 36 of Eldada discloses the use of a heater for heating the filter element. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Eldada into the device of Hayakawa and Pan by providing a heater for heating the heat sensitive expandable member. The ordinary artisan would have been motivated to modify Hayakawa and Pan in the manner set forth above for at least the purpose of controlling the wavelength of the output light within greater range, independent of the ambient temperature.

Claims 1, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa (U.S. Pub. 2002/0009102) and further in view of Morey et al. (5,007,705).

Regarding **claim 1**, Fig 24 of Hayakawa discloses "A wavelength conversion laser apparatus comprising a semiconductor light device [100], an optical fiber having a grating [23] provided therein, a wavelength conversion device [15] for receiving an input light from an optical resonator which consists mainly of the semiconductor light emitting device [100] and the optical fiber [23] and releasing a harmonic of the input light [2nd harmonic, paragraph 197 lines 4-7]. Hayakawa does not discloses "A grating expanding means for expanding the grating in its lengthwise direction to match the wavelength of the output light from the optical resonator with the wavelength of the input light, where the wavelength of the input light can be converted by the wavelength conversion device".

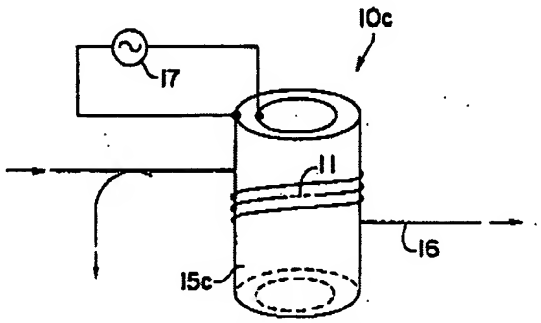


FIG. 4

However, Fig 4 of Morey disclose a tunable Bragg grating that adjusts the wavelength of the output light by changing the length of the fiber Bragg grating. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Morey into the device of Hayakawa by substituting the fiber Bragg grating with a tunable fiber Bragg grating. The ordinary artisan would have been motivated to modify Hayakawa in the manner set forth above for at least the

purpose of making the laser output more stable by making it independent of the ambient temperature.

Regarding **claim 5**, Hayakawa and Morey disclose a wavelength conversion laser apparatus as described above,

"wherein the grating expanding means [10c] comprises a expandable member [15c] of a ring or disk shape having an outer side thereof arranged on which a portion of the optical fiber [16] including the grating [11] is wound" (Fig 4 of Morey). Morey discloses the expandable member to be a piezoelectric element, which is controlled by a voltage supply. Morey does not disclose the expandable member to be heat-sensitive, which is controlled by a heating means.

However the use of heat sensitive expandable materials controlled by heating means is well known in the art. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hayakawa and Morey by substituting piezoelectric element controlled by a voltage supply with a heat sensitive element controlled by a heater for at least the purpose of reducing the cost of the device, since the heat sensitive elements such as metals cost less and require significantly less power to operate than the piezoelectric elements.

Regarding **claim 6**, Hayakawa and Morey disclose a wavelength conversion laser apparatus as described above,

"wherein the grating expanding means comprises a bar-like piezoelectric member arranged to secure the optical fiber at two locations between which the grating is installed and a voltage the impressing means for supplying piezoelectric member with

a voltage to increase the distance between the two locations" (col. 5 lines 24-29 of Morey).

Claim 7, 8, 9, 11/9, 12/9 and 13/9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa (U.S. Pub. 2002/0009102) and further in view of Pan et al. (U.S. Pat. 6,181,851).

Regarding **claims 7 and 8**, Fig 24 of Hayakawa discloses "A wavelength conversion laser apparatus comprising a semiconductor light emitting device [100], an optical fiber having a grating [23] provided therein, a wavelength conversion device [15] for receiving an input light from an optical resonator which consists mainly of the semiconductor light emitting device [100] and the optical fiber [23] and releasing a harmonic of the input light [2nd harmonic, paragraph 197 lines 4-7].

Hayakawa does not discloses "a resonant wavelength adjusting means for adjusting the wavelength of the light from the optical resonator in accordance with the temperature so as to maintain the harmonic of the light from the wavelength conversion device constant or substantially constant regardless of a change in the temperature of the wavelength conversion device; wherein the resonant wavelength adjusting means is a grating expanding means for expanding the grating in it's lengthwise direction.

However, Fig 2A of Pan discloses a tunable Bragg grating that adjusts the wavelength of the output light by changing the length of the fiber Bragg grating. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Pan into the device of Hayakawa by substituting the fiber Bragg grating with a tunable fiber Bragg grating. The ordinary artisan would have been

motivated to modify Hayakawa in the manner set forth above for at least the purpose of adjusting the wavelength of the output light to the desired value to produce a multi-wavelength laser.

Regarding **claims 9 and 13/9**, Hayakawa and Pan disclose a wavelength conversion laser apparatus as described above,

"wherein the grating expanding means comprises a bar-like heat-sensitive expandable member [30, 32] for securing the optical fiber [12] at two locations [34] between which the grating [22] is installed,

wherein the heat-sensitive expandable member [30,32] comprises two or more materials [stainless steel and Kovar^{TM}, col. 5 lines 26-28], which are different in the linear expansion coefficient (col.5 lines 15-17) and are bonded to each other [28] (Fig 2A of Pan).

Regarding **claims 11/9 and 12/9**, Hayakawa and Pan, disclose a wavelength conversion laser apparatus as described above, but they do not specify that "the heat-sensitive expandable member is made of a plastic material or has a linear expansion coefficient of $5 * 10^{-5}$
(K^{-1}) - $6*10^{-5}$ (K^{-1})."

However, it is well know that various plastic (resin, polymer) materials have very high coefficients of expansion, higher than the coefficient of expansion of metal. Therefore it would have been obvious to one ordinary skilled in the art to use plastic material with the coefficient of expansion in the range specified above as the heat sensitive expandable member. The ordinary artisan would have been motivated to use

plastic-type materials for at least the purpose of creating a device with increased sensitivity to temperature, that will match the temperature sensitivity of a fiber grating made of polymer material.

Claim 7, 8, 10, 11/10, and 12/10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa (U.S. Pub. 2002/0009102) and further in view of Morey et al (U.S. Pat.5,007,705).

Regarding **claims 7 and 8**, Fig 24 of Hayakawa discloses "A wavelength conversion laser apparatus comprising a semiconductor light emitting device [100], an optical fiber having a grating [23] provided therein, a wavelength conversion device [15] for receiving an input light from an optical resonator which consists mainly of the semiconductor light emitting device [100] and the optical fiber [23] and releasing a harmonic of the input light [2^{nd} harmonic, paragraph 197 lines 4-7].

Hayakawa does not discloses "a resonant wavelength adjusting means for adjusting the wavelength of the light from the optical resonator in accordance with the temperature so as to maintain the harmonic of the light from the wavelength conversion device constant or substantially constant regardless of a change in the temperature of the wavelength conversion device; wherein the resonant wavelength adjusting means is a grating expanding means for expanding the grating in it's lengthwise direction.

However, Fig 4 of Morey discloses a tunable Bragg grating that adjusts the wavelength of the output light by changing the length of the fiber Bragg grating. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Morey into the device of Hayakawa by substituting the

fiber Bragg grating with a tunable fiber Bragg grating. The ordinary artisan would have been motivated to modify Hayakawa in the manner set forth above for at least the purpose of adjusting the wavelength of the output light to the desired value to produce a multi-wavelength laser.

Regarding **claim 10**, Hayakawa and Morey disclose a wavelength conversion laser apparatus as described above,

"wherein the grating expanding means [10c] comprises a expandable member [15c] of a ring or disk shape having an outer side thereof arranged on which a portion of the optical fiber [16] including the grating [11] is wound" (Fig 4 of Morey). Morey discloses the expandable member to be a piezoelectric element. Morey does not disclose the expandable member to be heat-sensitive.

However, the use of heat sensitive expandable materials is well known in the art. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hayakawa and Morey by substituting piezoelectric element with a heat sensitive element for at least the purpose of reducing the cost of the device, since the heat sensitive elements such as metals cost less and require significantly less power to operate than the piezoelectric elements.

Regarding **claims 11/10 and 12/10** Hayakawa and Morey disclose a wavelength conversion laser apparatus as described above, but they do not specify that "the heat-sensitive expandable member is made of a plastic material or has a linear expansion coefficient of $5 * 10^{-5}$ (K^{-1}) - $6 * 10^{-5}$ (K^{-1})."

However, it is well know that various plastic (resin, polymer) materials have very high coefficients of expansion, higher than the coefficient of expansion of metal. Therefore it would have been obvious to one ordinary skilled in the art to use plastic material with the coefficient of expansion in the range specified above as the heat sensitive expandable member. The ordinary artisan would have been motivated to use plastic-type materials for at least the purpose of creating a device with increased sensitivity to temperature, that will match the temperature sensitivity of a fiber grating made of polymer material.

Claim 13/10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayakawa and Morey and further in view of Pan.

Regarding **claim 13/10**, Hayakawa and Morey disclose a wavelength conversion laser apparatus as described above, but do not disclose that "the heat-sensitive expandable member comprises two or more materials, which are different in the linear expansion coefficient and are bonded to each other."

However, the use of a combination of two or more materials of different expansion coefficients is well known in the art (col.1 lines 44-47 of Pan). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Pan into the device of Hayakawa and Morey by substituting the heat sensitive expandable member composed of one material with an expandable member composed of two or more materials. The ordinary artisan would have been motivated to modify Hayakawa and Morey in the manner set forth above for at least the purpose of achieving the desirable expansion coefficient.

Fax/Telephone Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marcia A. Golub whose telephone number is 571-272-0218. The examiner can normally be reached on M-F 8-5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Zandra Smith

MAG

ZANDRA V. SMITH
PRIMARY EXAMINER